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EDITORIAL

The Role of the Vascular Surgeon in Diagnosis and Treatment of Impotence

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Introduction

Since Leriche's classic paper in 1923 citing impotence as one of the first symptoms in men with aortoiliac occlusion, vascular surgeons have been interested in impotence.[1] Early operations for aortoiliac occlusive and aneurysmal disease often provoked postoperative impotence or other sexual disabilities further stimulating interest in this area.[2] Techniques of aortic reconstruction now minimise sexual disabilities by avoiding genital autonomic nerve injury and perfusing the internal iliac arteries;[3] these methods also correct impotence in certain cases. As a result of research on arteriogenic impotence, it was later discovered that pudendal and penile artery occlusion and cavernosal leakage also cause impotence. These dysfunctions can be corrected in some cases by microvascular operations.

Corporal smooth muscle dysfunction also relates importantly to impotence, particularly in diabetes where impaired neurogenic and endothelium mediated relaxation are dominant factors.[4] Table 1 classifies anatomic and functional causes of vasculogenic impotence. The unique physiology of erection requires adequate arterial inflow and closure of venous outflow, both mediated by neural mechanisms and by relaxation of the cavernous smooth muscle. Increased arterial inflow with cavernous smooth muscle relaxation causes closure of venous outflow, and during erection, intracavernous pressure increases from 15 mm Hg to levels ranging from 80 to 90 mm Hg.[5]

Table 1. Causes of vasculogenic impotence

Arterial	Large vessel:	Aortoiliac occlusion
	Small vessel:	Internal iliac anterior division, pudendal and penile arteries
	Combined:	Atheroembolism: aneurysm or ulcerated aorta
Cavernosal Factors	Arteriolar:	Functional or helicine artery abnormality
	Fibrosis:	Post-priapic, drug injection, ageing
	La Peyronie:	Deformity, cavernosal leakage
	Smooth muscle:	Diabetes, hormonal lack, blood pressure medication
Venous	Acquired:	Tunic albuginea abnormalities: patterns include dorsal vein, crural and spongiosum leaks
	Congenital:	Cavernous spongiosum leak existing since childhood
	Mixed:	Leakage with inadequate arterial inflow of any etiology

Diagnostic Studies

History and physical examination in men with aortoiliac disease reveal the usual prevalence and duration of risk factors for atherosclerosis, especially smoking, hypertension, hypercholesterolemia and more rarely diabetes. When absent femoral pulsations or an aneurysm are present, atherosclerosis involves the aortoiliac segments and sometimes proximal segments of the internal iliac artery. These findings indicate large vessel arteriogenic impotence and are indications for reconstruction, not for impotence *per se* but mainly related to the severity of claudication and aneurysm size. In screening over 1 000 men, about 12 to 14% with a chief complaint of impotence have

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aortoiliac disease and about 1 in 100 has an occult aneurysm.

Examination and testing for small vessel disease, venous leakage and cavernosal dysfunction are complex. Before these are done, the author recommends penile brachial indices (PBPI) and pulse volume recordings.[6] A penile brachial index of about 0.75 suggests that no major occlusion exists between the aorta and the distal measurement point on the penis, while a PBPI of less than 0.6 suggests major vascular occlusion. Abnormal plethysmography can occur with either, but with normal indices, flat plethysmographic recordings are more often associated with small vessel disease. A sequence of neurovascular testing is useful preoperatively as neurologic disorders contribute to erectile failure.[6] About 28% of impotent men exhibit some type of neurologic disorder, elicited by testing of pudendal, lumbar and cortical somatosensory evoked potentials. This usually contraindicates vascular reconstruction for impotence. Additionally 23% of men with the diagnosis of venous leakage actually have small vessel arterial occlusion, emphasising the need for dynamic infusion cavernosometry and cavernosography and selective pudendal arteriography before microvascular reconstruction.[7]

At the time of office examination, after initial neurovascular screening, it is useful to inject the corpora cavernosa with 10–30 micrograms of prostaglandin E_1 to observe the erectile response. Intracorporal prostaglandin E_1 will often override fairly substantial arteriogenic impotence but may fail in severe cases of small vessel occlusion, cavernosal leakage, or refractory smooth muscle. Psychogenic factors also contribute to failure in the office setting. Failure of erection after injection is an indication for invasive testing including cavernosometry, cavernosography and measurement of cavernosal artery occlusion pressure. In the usual cases seen by the vascular surgeon, i.e., aortoiliac disease, standard arteriography with oblique views of the internal iliac arteries should suffice. With more distal involvement, selective pudendal arteriography after penile injection of papaverine to produce tumescence, not full erection is needed to plan microvascular procedures.

Treatment

Medical treatment

Before surgical intervention, cessation of smoking, control of hypercholesteremia and diabetes, and alteration of antihypertensive treatment by weight reduction or change in drug therapy should be tried. Some cases of arteriogenic impotence respond to oral isoxsuprine 10–20 mg, 4 times a day. Yohimbine hydrochloride 5.4 mg. t.i.d. is also effective, though its mechanism of action is unknown. In the author's experience, 15–20% of men resume satisfactory erectile function with medical treatment. With the addition of self-injection of prostaglandin, medical treatment is applicable to most patients with vasculogenic impotence, provided aneurysmal disease is excluded.

Surgical treatment

Aortoiliac operations are done for conventional indications i.e. claudication or aneurysms, using operative techniques to prevent sexual disability. These use dissection measures to preserve neural elements and highlight the importance of maintaining internal iliac flow. As stated by Dr Puech-Leao, the internal iliac artery should not become the "litter box" of the aorta. Internal iliac endarterectomy or bypass in conjunction with correction of aortoiliac disease is rewarding in selected cases. Prior to aneurysm repair, angiographic information about the anatomy of the internal iliacs helps plan methods to perfuse these arteries, preferably in a prograde fashion.

Procedures used occasionally for impotence include internal iliac endarterectomy, using an extraperitoneal approach. Penile microvascular surgery is suitable in about 5–6% of men presenting with impotence. The preferred inflow source is the inferior epigastric artery. The chances of success in penile microvascular surgery are best in young people with traumatic occlusion, e.g. pelvic fractures, or occlusive lesions of the pudendal artery at Alcock's canal.

Arterialisation of the deep dorsal vein, using the inferior epigastric artery is useful when the penile arteries are atretic. The mechanism of this procedure is not understood. With follow-ups longer than 12 months, about half these men report spontaneous firm erections and about 70% achieve firm erections with intracavernous injections that were previously ineffective. Furlow *et al.* reported on 156 men with 68% normal function following deep dorsal vein revascularisation with follow-up ranging from 6 months to 7.5 years.[9] Venous interruption procedures are similarly useful where dorsal vein leakage is dominant.[10] About 70%of these men become sensitive to intracavernous injections which previously failed. Other surgical options include penile prostheses which are indicated in men with neurologic or postoperative neurologic

abnormalities unresponsive to intracavernous injection. Once a prosthesis is used, penile revascularisation or intracavernous injections will not be possible.

Conclusions

Exciting progress in understanding the physiology of erectile function has occurred in the last 15 years. This field involves several disciplines, including urology, vascular surgery, psychiatry, radiology, neurology and endocrinology. More precise testing capabilities, as well as intracavernous injections now make possible a quantitative delineation of abnormalities causing impotence. The vascular surgeon plays an important role in diagnosis and needs to be aware of diagnostic quantitative testing for erectile dysfunction.[6, 8] In practice, operative techniques which minimise or prevent postoperative sexual dysfunction should be familiar to vascular surgeons along with a sensitivity to the presence of occult aneurysms in certain cases of impotence.

References

1 Leriche R. Des obliterations arterielle hautes (obliteration de la terminasion de l'aorte) comme causes des insuffisance circulatoires des membres inferieurs. *Bull Mem Soc Chir* 1923; **49**: 1464.
2 May AG, DeWeese JA, Rolo GC. Changes in sexual function following operation on the abdominal aorta. 1969; **65**: 41.
3 DePalma RG, Levine SG, Feldman S. Preservation of erectile function after aortoiliac reconstruction. 1978; **113**: 958.
4 Saenz de Tejada I, Goldstein I, Azadozoi K, *et al.* Impaired neurogenic and endothelium mediated relaxation of penile smooth muscle from diabetic men with impotence. *N Engl J Med* 1989; **320**: 1025.
5 Michal V. Arteriogenic impotence. *Angio Archiv* 1985; **8**: 4.
6 DePalma RG, Ensellem HA, Edwards CM, *et al.* A screening sequence for vasculogenic impotence. *J Vasc Surg* 1987; **5**: 228.
7 DePalma RG, Dalton CM, Gomez CA. Predictive value of a screening sequence for venogenic impotence. *Int J Impot Res* 1992; **4**: 143.
8 DePalma RG, Schwab FJ, Emsellem HD, *et al.* Noninvasive assessment of impotence. *Surg Clin N Am* 1990; **70**: 119.
9 Furlow WL, Knoll LD, and Benson RC Jr. Deep dorsal vein arterialization applications of the Furlow-Fisher modification in 156 patients with vasculogenic impotence. *Int J Impot Res* 1992; **4**: 187A.
10 DePalma RG, Schwab FJ, Druy EM, *et al.* Experience in the diagnosis and treatment of impotence caused by cavernosal leak syndrome. *J Vasc Surg* 1989; **10**: 117.